



## DEPARTMENT OF TRANSPORTATION

### Federal Aviation Administration

#### 14 CFR Part 27

[Docket No. FAA-2021-0705; Special Conditions No. 27-056-SC]

#### **Special Conditions: Vector Aerospace Helicopter Services USA, Airbus Helicopters Model AS350B2 and AS350B3 Helicopters; Stability Augmentation System and Automatic Flight Control System**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final special conditions; request for comments.

**SUMMARY:** These special conditions are issued for the Airbus Helicopters (Airbus) Model AS350B2 and AS350B3 helicopters. These helicopters, as modified by Vector Aerospace Helicopter Services USA (Vector), will have a novel or unusual design feature when compared to the state of technology envisioned in the airworthiness standards for helicopters. This design feature is the installation of a stability augmentation system and automatic flight control system (SAS/AFCS). The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

**DATES:** These special conditions are effective [INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER]. Send comments on or before [INSERT DATE 45 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER].

**ADDRESSES:** Send comments identified by Docket No. FAA-2021-0705 using any of the following methods:

- *Federal eRegulations Portal:* Go to <http://www.regulations.gov/> and follow the online instructions for sending your comments electronically.

- *Mail:* Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE, Room W12-140, West Building Ground Floor, Washington, DC, 20590-0001.
- *Hand Delivery or Courier:* Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE, Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.
- *Fax:* Fax comments to Docket Operations at 202-493-2251.

*Privacy:* Except for Confidential Business Information (CBI) as described in the following paragraph, and other information as described in 14 CFR 11.35, the FAA will post all comments received without change to <http://www.regulations.gov/>, including any personal information you provide. The FAA will also post a report summarizing each substantive verbal contact received about this document.

*Confidential Business Information:* CBI is commercial or financial information that is both customarily and actually treated as private by its owner. Under the Freedom of Information Act (FOIA) (5 U.S.C. 552), CBI is exempt from public disclosure. If your comments responsive to this document contain commercial or financial information that is customarily treated as private, that you actually treat as private, and that is relevant or responsive to this document, it is important that you clearly designate the submitted comments as CBI. Please mark each page of your submission containing CBI as “PROPIN.” The FAA will treat such marked submissions as confidential under the FOIA, and the indicated comments will not be placed in the public docket of this document. Submissions containing CBI should be sent to Marie Hogestad, Aircraft Information Systems Section, AIR-620, Technical Innovation Policy Branch, Policy and Innovation Division, Aircraft Certification Service, Federal Aviation Administration, 2200 S 216<sup>th</sup> Street, Des Moines, WA 98198; telephone 206-231-3157; email [Marie.Hogestad@faa.gov](mailto:Marie.Hogestad@faa.gov). Comments the FAA receives, which are not specifically designated as CBI, will be placed in the public docket for this rulemaking.

*Docket:* Background documents or comments received may be read at <http://www.regulations.gov/> at any time. Follow the online instructions for accessing the docket or go to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE, Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

**FOR FURTHER INFORMATION CONTACT:** Marie Hogestad, Aircraft Information Systems Section, AIR-620, Technical Innovation Policy Branch, Policy and Innovation Division, Aircraft Certification Service, Federal Aviation Administration, 2200 S 216<sup>th</sup> Street, Des Moines, WA 98198; telephone 206-231-3157; email [Marie.Hogestad@faa.gov](mailto:Marie.Hogestad@faa.gov).

**SUPPLEMENTARY INFORMATION:**

**Reason for No Prior Notice and Comment Before Adoption**

The FAA has determined, in accordance with 5 U.S.C. §§ 553(b)(3)(B) and 553(d)(3), that notice of, and opportunity for prior public comment hereon are unnecessary because substantially identical special conditions have been previously subject to the public comment process in several prior instances such that the FAA is satisfied that new comments are unlikely. For the same reason, the FAA finds that good cause exists for adopting these special conditions upon issuance. The FAA is requesting comments to allow interested persons to submit views that may not have been submitted in response to the prior opportunities for comment.

**Comments Invited**

The FAA invites interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data.

The FAA will consider all comments received by the closing date for comments. The FAA may change these special conditions based on the comments received.

## **Background**

On February 21, 2019, Vector applied for a supplemental type certificate for the installation of SAS/AFCS on the Airbus Model AS350B2 and AS350B3 helicopters. The Airbus Model AS350B2 and AS350B3 helicopters are 14 CFR part 27 normal category, single turbine engine, conventional helicopters designed for civil operation. These helicopters can carry up to six passengers with one pilot and have a maximum takeoff weight of up to 6,173 pounds, depending on the model configuration. The major design features include a three-blade main rotor, an anti-torque tail rotor system, skid landing gear, and a visual flight rule basic avionics configuration. Vector proposes to modify these model helicopters by installing the Thales Compact Autopilot System (CAPS), which is a 4-axis SAS/AFCS.

## **Type Certification Basis**

Under the provisions of 14 CFR 21.101, Vector must show that the Airbus Model AS350B2 and AS350B3 helicopters, as changed, continue to meet the applicable provisions of the regulations listed in Type Certificate No. H9EU or the applicable regulations in effect on the date of application for the change, except for earlier amendments as agreed upon by the FAA.

If the Administrator finds that the applicable airworthiness regulations (e.g., 14 CFR part 27) do not contain adequate or appropriate safety standards for the Airbus Model AS350B2 and AS350B3 helicopters because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the applicant apply for a supplemental type certificate to modify any other model included on the same type certificate to incorporate the same novel or unusual design feature, these special conditions would also apply to the other model under § 21.101.

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type certification basis under § 21.101.

## **Novel or Unusual Design Feature**

The Airbus Model AS350B2 and AS350B3 helicopters will incorporate the following novel or unusual design feature: SAS/AFCS. An AFCS is a system used to control the trajectory of an aircraft without constant input from the pilot. The AFCS allows the pilot to focus on other aspects of the operation, such as weather and other systems. SAS is another automatic control system; however, instead of maintaining the aircraft on a predetermined attitude or flight path, the SAS will reduce pilot workload by dampening the aircraft buffeting regardless of the attitude or flight path.

## **Discussion**

The Thales CAPS (SAS/AFCS) utilizes serial and parallel actuators installed in each control axis to provide an enhancement to basic aircraft stability and handling qualities and allow fully automatic vertical and lateral autopilot coupling. Consequently, the Thales CAPS installed in the Airbus Model AS350B2 and AS350B3 helicopters may include failure modes that could prevent continued safe flight and landing.

When § 27.1309(b) and (c) were promulgated, it was not envisioned that this type of rotorcraft would use systems whose failures could result in "Catastrophic" or "Hazardous/Severe-Major" failure conditions, or complex systems whose failures could result in "Major" failure conditions, as defined in FAA Advisory Circular 27-1B *Certification of Normal Category Rotorcraft* (AC 27-1B). Accordingly, the crew's interaction with these types of systems and awareness of their behavior and operating condition was not addressed. Paragraph (c) of these special conditions addresses the crew's interaction with information concerning unsafe system operating conditions. An unsafe system operating condition would cause serious injuries or fatalities. Therefore, 14 CFR 27.1309 (b) and (c) do not adequately address the safety requirements to certify this type of system installation.

The Airbus Model AS350B2 and AS350B3 helicopters type certification basis as modified by Vector does not contain adequate airworthiness standards for the SAS/AFCS.

Therefore these special conditions require Vector to provide the FAA with a systems safety assessment (SSA) for the final SAS/AFCS installation configuration to adequately address the safety objectives established by the functional hazard assessment (FHA) required by § 27.1309. This process will ensure that Vector adequately address all failure conditions and effects for the installed SAS/AFCS.

The SSA process is part of the overall safety assessment process discussed in AC 27-1B and Society of Automotive Engineers document Aerospace Recommended Practice 4761, *Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment*.

These special conditions require that the SAS/AFCS installed on Airbus Model AS350B2 and AS350B3 helicopters meet the requirements to address the failure effects identified by the FHA adequately and subsequently verified by the SSA, within the defined design integrity requirements.

Failure conditions are classified according to the severity of their effects on the rotorcraft. Radio Technical Commission for Aeronautics, Inc. (RTCA) Document DO-178C, *Software Considerations in Airborne Systems and Equipment Certification*, provides software design assurance levels most commonly used for the major, hazardous/severe-major, and catastrophic failure condition categories. The SAS/AFCS equipment should be qualified for the expected installation environment. The FAA recognizes the test procedures prescribed in RTCA Document DO-160G, *Environmental Conditions and Test Procedures for Airborne Equipment*, as acceptable methodologies for finding compliance with the environmental requirements. Equivalent environment test standards may also be acceptable.

The environmental qualification provides data to show that the SAS/AFCS can perform its intended function under the expected operating condition. Some of the main considerations for environmental concerns are installation locations and the resulting exposure to environmental conditions for the SAS/AFCS equipment, including considerations for other equipment that may

also be affected environmentally by the SAS/AFCS equipment installation. The level of environmental qualification must be related to the severity of the considered failure conditions and effects on the rotorcraft.

These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

### **Applicability**

As discussed above, these special conditions are applicable to the Airbus Model AS350B2 and AS350B3 helicopters with the SAS/AFCS installed. Should Vector apply at a later date for a supplemental type certificate to modify any other model included on Type Certificate No. H9EU to incorporate the same novel or unusual design feature, these special conditions would apply to that model as well.

### **Conclusion**

This action affects only a certain novel or unusual design feature on the Airbus Model AS350B2 and AS350B3 helicopters. It is not a rule of general applicability and affects only the applicant who applied to the FAA for approval of these features on these helicopters.

### **List of Subjects in 14 CFR Part 27**

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

### **Authority Citation**

The authority citation for these special conditions is as follows:

**Authority:** 49 U.S.C. 106(f), 106(g), 40113, 44701, 44702, 44704.

### **The Special Conditions**

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for the Airbus

Helicopters (Airbus) Model AS350B2 and AS350B3 helicopters, as modified by Vector Aerospace Helicopter Services USA.

For certification of the stability augmentation system and automatic flight control system (SAS/AFSC) installed on Airbus Model AS350B2 and AS350B3 helicopters, instead of the requirements of 14 CFR 27.1309(b) and (c), the following must be met:

- (a) These systems and their equipment must be designed and installed so that they do not adversely affect the safety of the rotorcraft or its occupants.
- (b) These systems and their associated components considered separately and in relation to other systems must be designed and installed so that:
  - (1) The occurrence of any catastrophic failure condition is extremely improbable;
  - (2) The occurrence of any hazardous failure condition is extremely remote; and
  - (3) The occurrence of any major failure condition is remote.
- (c) Information concerning an unsafe system operating condition must be provided in a timely manner to the crew to enable them to take appropriate corrective action. An appropriate alert must be provided if immediate pilot awareness and immediate or subsequent corrective action are required. These systems and their controls, including indications and annunciations, must be designed to minimize crew errors that could create additional hazards.

Issued in Kansas City, Missouri, on January 4, 2022.

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